Discriminating a gravitational wave background from instrumental noise in the LISA Interferometric detector

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ABSTRACT

LISA (Laser Interferometer Space Antenna) is a proposed mission which will use coherent laser beams exchanged between three remote spacecraft, to detect and study low-frequency cosmic gravitational radiation [1]. The multiple Doppler readouts available with LISA, which incorporate frequency standards for measuring phase differences between the received and transmitted laser beams, permit simultaneous formation of several observables [2], [3, [4]. All are independent of lasers and frequency standards phase fluctuations, but have different couplings to gravitational waves and to the various LISA instrumental noises. Comparison of the conventional Michelson interferometer observable with the fully-symmetric Sagnac data-type allows unambiguous discrimination between a gravitational wave background and instrumental noise. The method presented here can be used to detect and measure a confusion-limited gravitational wave background.

REFERENCES

[1] Bender, P., Danzmann, K., & the LISA Study Team, *Laser Interferometer Space Antenna for the Detection of Gravitational Waves, Pre-Phase A Report*, **MPQ233** (Max-Planck-Institüt für Quantenoptik, Garching), July 1998.

[2] M. Tinto, & J.W. Armstrong, *Phys. Rev. D*, **59**, 102003 (1999).

[3] J.W. Armstrong, F.B. Estabrook, & M. Tinto *Ap. J.*, **527**, 814 (1999)

[4] F.B. Estabrook, M. Tinto, & J.W. Armstrong, *Phys. Rev. D*, **62**, 042002 (2000)

[5] M. Tinto, J.W. Armstrong, & F.B. Estabrook, *Phys. Rev. Letters*, submitted for publication.